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ORIGINAL ARTICLE

Role Of Embankment In Flood: A Study In The Confluence Zone Of Kunur And Ajay Rivers, Lower Ajay River Basin, West Bengal

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Abstract:

Floods in India have been a common yearly occurrence. In 1954, National Floods Control Programme (NFCP) was adopted several measures to minimize their devastation. But, Floods continued its annual visitation with varying degrees of affecting power. Sometimes, Embankment, a major structural measure for floods may create negative environment for flood and water logging condition for any floodplain. The present paper has been prepared as a flood risk assessment study for the confluence zone of the Kunur River and the Ajay River, related to the present and absence of embankment along the Ajay River bank, which increasing basin run-off and channel discharge, modifying channel width, helps to spread over river water in the floodplains.

KEYWORD:

Flood, Embankment, Confluence Zone, Basin Runoff, Channel Width and Discharge.

INTRODUCTION

Embankment are constructed either to contain river within their drainage channel as preventive measure or around settlements, towns and agricultural fields as a protective measure. Embankments as flood preventive measure were constructed all over the country during the British rule for uninterrupted linkages established through railways and roads (Munsi, 1998). Suitability of Embankment has been a matter of controversy. According to the Irrigation Commission, “Embankments also are liable to failure and when the fail, the damage can be much greater than if there were no embankment”. Flood is caused due to inadequate capacity within the bank of rivers to contain the high flows brought down from the upper-catchment due to concentrated heavy rainfall. To protect areas from flooding, provision of marginal embankment along river banks and littoral areas was an age old practice perhaps since the dawn of civilization (Mukhopadhyay & Dasgupta, 2010). The total length of the Ajay embankment is about 136.16 km, out of which the right bank accounts about 80.97 km and left bank comprises about 55.19 km. The total area protected by the right bank embankment is about 37040 hectares and the left bank embankment protects about 29785hectares. In the lower Ajay embankment were mainly constructed for the protection of fertile agricultural lands, floodplain settlements and towns. But, in this part discontinuity of embankment creates several problems for the floodplain areas, particularly missing of embankment in the confluence zone of the Kunur River and the Ajay River.

2. OBJECTIVE

The major objectives of this paper are calculating the Flood Frequency in the study area since 1900 and analysis the Negative Impacts of Embankment for floods in the confluence zone of the Kunur River and the Ajay River.

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3. STUDY AREA

Ajay is one of the major flood prone rivers in West Bengal. It flows along the entire northern edge of Barddhaman district and acts as an administrative boundary between Barddhaman District in south and Birbhum District in north. The study area is mainly the confluence zone of the Ajay River and its major right bank tributary Kunur River. This confluence zone spatially belongs to the Barddhaman District because it is the right bank confluence point of the Ajay River. Geometrically, this confluence point is situated at the apex point of the Ajay's meander towards the Mangalkote and Lakhuria Gram Panchayats (G.P.), at the middle of the northern edge of Barddhaman District. The study area is well connected with main Burdwan Town by the Barddhaman-Katwa Road with distance of 32 km. only. The other main surrounding towns are Bolpur, 28 km. away in the north-west direction and Guskara, 12km away in the west direction from the study area. Administratively, the study area comes under the Mangalkote G.P. and Lakhuria G.P. of Mangalkote Block in Barddhaman District and more particularly in between the Natunhat (Mangalkote) and Kogram (Lakhuria) mouzas (small administrative unit).

The confluence zone extends from 23°29′N to 23°33′21′′N latitudes and 87°48′53′′E to 87°56′55′′E longitude, (Topographical Sheet Number 73M/14 &73M/15 at 1:50000 scale of Survey of India, 1976 (Fig.1). At present, the location of the confluence point is 23°32′23.2′′N/87°54′03.4′′E (Field Survey with GPS, May, 2012).

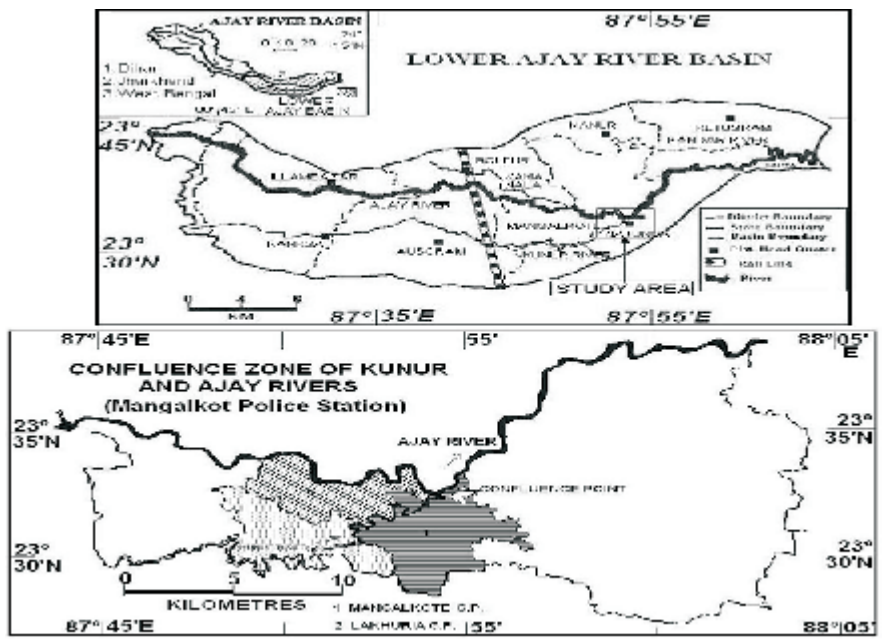

Figure 1: Location of the Study Area

4. METHODS AND MATERIALS

The study has been done by vast literature survey of books and journals and also research articles related to Lower Ajay River Basin floods and underlying characteristics. Several official documents related to the research problem have been examined. To know the actual condition of flood in the confluence zone, frequent field visit and interaction with the local people have been organized. For the analysis the Flood Frequency simple percentage and cumulative percentage frequency of last 107 years flood record data are used in every 10 years interval and analysis it for frequency trend after embankment construction in study area.

5. RESULT AND DISCUSSION

5.1 Flood History

After through study about the flood history of the study area, it is clearly noticed that the lower

Ajay River Basin has been suffering from floods since time immemorial. The major recorded flooded years are 1956, 1959, 1970, 1971, 1973, 1978, 1984, 1995, 1999, 2000, 2005, and 2007. Frequently, floods are generally observed below Illambazar particularly after the confluence point of the Hinglo River (Mukhopadhyay, 2010). This portion of the Ajay Basin is facing the menace of floods in almost every year. Like the condition of Hinglo River, the confluence zone of the Kunur River and the Ajay River is also tormenting each year by floods, what has been found out in this empirical investigation. Particularly, this confluence zone is more vulnerable in nature for negative impact of embankment. According to the perception study and recorded secondary data, calculate flood frequency (Table.1) with the major floods in last 107 years between each decade.

Table 1: Trend of Flood Concentration before & after the construction of Embankment
(Source: Flood Record Data and Perception survey of local people)

Range of Time	*Flood Frequency*		*Cumulative Flood Frequency*	
	Frequency	**% of Frequency**	**Frequency**	**% of Cumulative Frequency**
1900-1910	0	0	0	0
1911-1920	2	12	2	2
1921-1930	1	6	3	4
1931-1940	1	6	4	5
1941-1950	1	6	5	6
1951-1960	2	12	7	8
1961-1970	1	6	8	10
1971-1980	3	18	11	13
1981-1990	1	6	12	14
1991-2000	3	18	15	18
2201-2007	2	12	17	20
Total	**17**	**100**	**84**	**100**

From this frequency analysis, it is clear that most of the devastative floods ever experienced by the existing generation of people are the floods of after 1956. It is also clearly evident that the normal and cumulative flood frequency has been progressively increasing over time in this basin area (Fig.2).

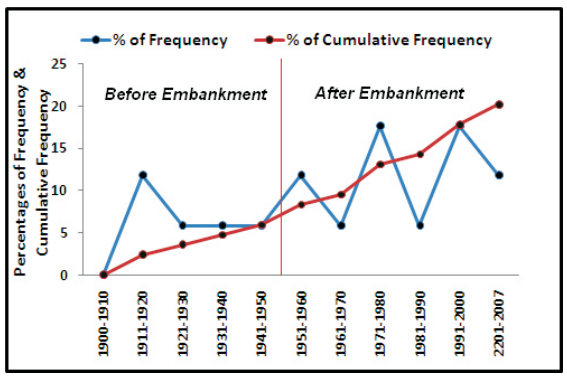

Figure 2: Showing the trend of Flood Frequency from 1956 to 2007
(Source: Flood Record Data and Perception survey of local people)

5.2 Embankment in Lower Ajay River Basin

During 18th & 19thcentury normal flood had occurred which resulted the formation of flood plain as there was no embankment in those days. A huge volume of water was flowing through the river of

sufficient depth. The river had tendency to shift its course and as a result flood plain had extended to a large extent of area. During British period in 19thcentury recorded major floods were in1867, 1877, 1885 & 1896. After that unusual high flood occurred in 1913, 1914causing serious loss of life and property, damage to standing crops, seeds and houses. The English district officer took immediate steps to help the people, suspension of revenue collection was ordered in all the flood-affected areas. To protect the fertile agricultural land and number of prospectus settlement Zamindari bundhs (embankment) were constructed and later these were transferred to Irrigation and Waterways Department, Govt. of West Bengal, after the flood of 1959 for maintenance and reconstruction.

5.3 Embankment Plays Negative Role for the Study Area

5.3.1 Changing Channel Character of Ajay River and Floods

As per the general system of river the widths gradually increases toward downstream. But due to the construction of embankment it is interestingly noted that at the upstream points like Pandabaswar (23º44´N, 87º17´E), Palashdanga (23º43´N, 87º23´E), width of the river are significantly more (1010 m. and 1225 m.) but at downstream near Kogram (23º33´N, 87º57´E) it becomes narrower about 125 m. and at the confluence point Katwa it is only 230 m. (Table.2). Consequently along with massive downpour sudden release of water of Hinglo Barrage upstream triggers the breaching of embankment. These embankments entrap the river and interestingly the width of the river gradually decreases downwards. Consequently, along with massive downpour, sudden release of water from Hinglo barrage upstream triggers the breaching of embankment. During peak discharge period there is well marked fluctuation found in between the two gauge stations as the floodwater passed out through those breaching points (Mukhopadhyay & Mukherjee, 2005). As a result, in the confluence zone of the Kunur River and the Ajay River the width of embankment is just 125 metres.

Table 2: Width of the Ajay downwards after the construction of embankment (GSI, 2000)

Name of the Village	*Location*	*Width in meters*
Pandabaswar	23°44'N, 87°17'E	1010
Palashdanga	23°43'N, 87°23'E	1225
Loda	23°42'30"N, 87°25'E	950
Kajaldighi	23°38'N, 87°26'30'E	625
Santashpur	23°37'N, 87°28'E	225
Gangapur	23°37'N, 87°31'20"E	400
Mongalpur	23°36'N, 87°33'E	300
Maloncha	23°36'15"N, 87°30'30"E	500
Bilosonda	23°36'30"N, 87°41'E	440
Santla	23°37'N, 87°44'E	175
Karimpur	23°34'40"N, 87°47'E	150
Kogram (Study Area)	**23°32'30"N, 87°54'E**	**125**
Srikrishnapur	23°36'20"N, 87°57'E	250
Katwa	23°39'N, 88°08'E	240

In this portion, Ajay River channel failure to carrying water and spill over the water from channel and flooded the surrounding area of this confluence zone. Due to these high embankments the main channel of Ajay gradually decreasing its water holding capacity due to rising up the river bed for huge amount of siltation. As a result, the river crosses its danger level quickly with a short span of rainfall and water level temporally increases during rainy season at Natunhat Gauge Station (Fig.3). For this flood is a common phenomenon in the study area.

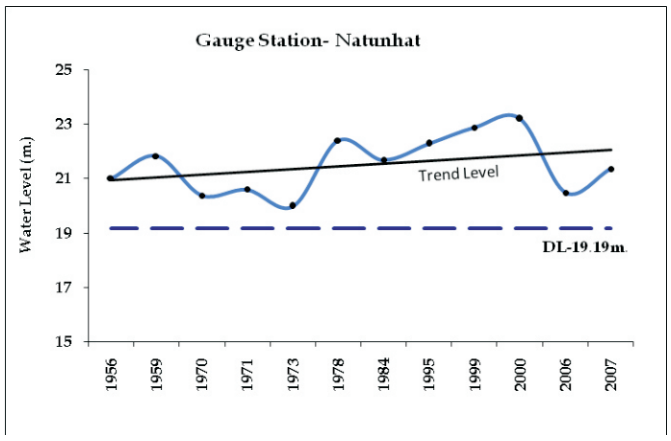

Figure 3: Water Level of Ajay River at Natunhat Gauge Station during Last Major Floods (Source: Irrigation and Waterways Directorate, Mayurakshi South Canal Division, Govt. of West Bengal)

5.3.2 Discontinuity of Embankment and Floods

As a major structural flood measure, embankments are constructed along the both side of the Ajay River in its lower basin area. This both side embankment helps the discharge of the Ajay River to flow within the barrier of embankment. In the lower Ajay River Basin, both side of embankment were mainly constructed from Pandabaswar to Katwa. Particularly, in the right bank side embankment is started from the confluence point of the Tumun River or Satkahonia to Kogram Village in a continuous way. But after Kogram Village there is no embankment up to the Joykrishnapur Village (Table 3). In between Kogram to Joykrishnapur, river water of the Ajay River gets a free entrance in the surrounding floodplain and generate flood over the Mangalkote Gram Panchayate (G.P.) and others (Fig. 4).

Table 3: Right Bank (RB) Embankment of the lower Ajay River (Source: Directorate of Irrigation and Waterways Department, West Bengal, 2008.)

Segment of Embankment in RB	Covering Police Station	Length (km.)	Present Status
Satkahonia to Kogram	Kanksa, Ausgram, Mangalkote	47	It is long and continuous embankment primarily made of earthen materials. In places of Malancha, Maliara Kogram, previously breached portions are repaired by boulders
Joykrishnapur to Kherura	Mangalkote	8.3	Though some boulders are used to reinforce the embankment but the recommended height and width of the embankment are not maintained properly. Embankment is very much affected by human activities.

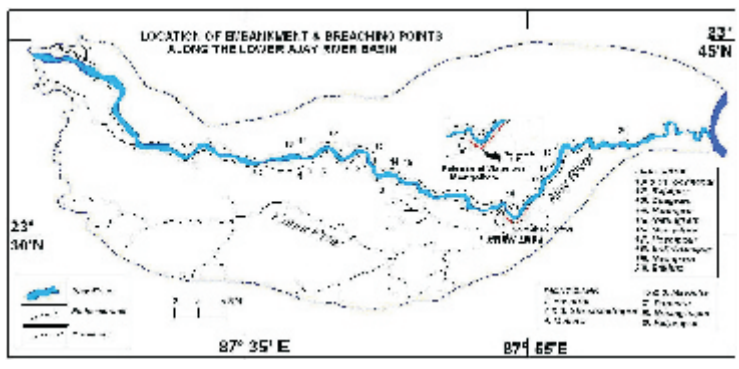

Figure 4: Embankment Character in Lower Ajay River Basin and the Study Area

5.3.3 Increasing Discharge of Kunur River and Floods

Kunur River is a major right bank tributary of the Ajay River with basin area of 813.2 sq.km.. This Basin area is located in the right bank of the lower Ajay River Basin. The Kunur River Basin originated from Faridpur-Durgapur Block, enclose with Kanksa, Ausgram, Mangalkote Blocks. The left side basin boundary of the Kunur River is demarcated by the right bank embankment of the Ajay River. The embankment of this part of Ajay River starts from the confluence point of the Tumun River to the Kogram in the Lakhuria Gram Panchayate of Mangalkote Block. In this part, there is no gap or door in the embankment for enters the surface runoff from the right bank basin area of the lower Ajay River Basin (Fig.5). As a result, the entire over land flow of this part enrich the quantity of water in the Kunur River Basin and in addition to increase the channel discharge of the Kunur River, but unfortunately in the downstream channel of the Kunur River is not capable to contain the total discharge of the entire basin. In this condition, during September and October months the excess water spill over channel of the Kunur River and occurring flood in the confluence zone of the Kunur River and the Ajay River.

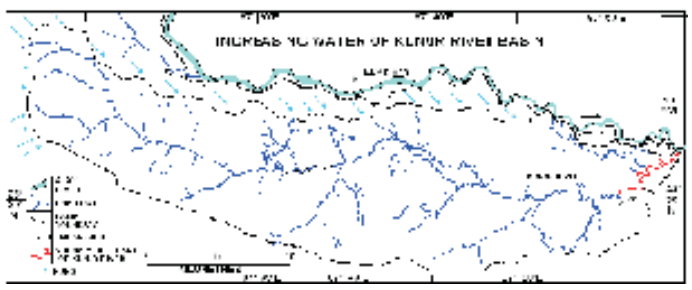

Figure 5: Increasing the Water of Kunur River Basin from Ajay's Catchment Area

Due to lack of proper construction and maintenance breaching occurred in the side of embankment at different place of lower Ajay River Basin. The number of breaching points rapidly increasing towards downstream. (Fig.5) It is also confined that the breaching points more consented in the right bank of river and number also increased with time, in 1978 it is 12, in 1999 it is 22 and in 2000 it is 25. Due to breaching of embankment and flood the most prominent effect is sands play as post flood hazard and water inter into the Kunur River Basin, after that Kunur gets huge water which flows through the Kunur River channel and in the confluence zone narrow width of the Kunur River can't able to discharge properly and spill over the surrounding area.

6. CONCLUSION

The flow of water within a stream channel is not a very simple one. Laboratory experiments have shown that whenever the velocity of water exceeds a certain limit, the channel describes a sinuous pattern (Sengupta, 2001). Flooding involves spilling over of water in motion in the stream channel. Periodic spilling is not only normal for a stream but it is also a very welcome process. The relationship between hydrologic and damaging flood is guided by numerous intervening factors such as, river channel modification, land use, structural mitigation etc (Pielke Jr., 2000). Flood is natural process of river which cannot be control and it is helpful for the floodplain areas also. In present, with the increase of population, floodplain areas are occupied by human civilization and encroaching the natural channel. As a result, structural flood mitigation strategies are plays a negative role of this floodplain civilization. As like, in the lower Ajay River Basin, particularly in the confluence zone of the Kunur River and the Ajay River embankment increase the chance of flood other than mitigate floods.

7. REFERENCES

Mukhopadhyay, S. 2010, A Geo-Environmental Assessment of Flood Dynamics in Lower Ajoy River Including Sand Splay Problem in Eastern India, Ethiopian Journal of Environmental Studies and Management, Vol.3 No.2.
Mukhopadhyay, S.C and Dasgupta, A. 2010, June, River Dynamics of West Bengal (Vol. II) Applied Aspect, Prayas

Publishers and Book Sellers, 1st Edition, Kolkata.
Munsi S.K. 1998, “Problems of Flood Management in India: Policies and Programmers” Calcutta, Geographical Review of India. Vol-60, No.-3, p.237-247
Pielke, R. A. Jr. (2000) Flood impact on society: Damaging flood as a framework for assessment. In Parker, D. J. (Ed) Floods, Vol.1, p.133 –156
Sengupta, S. (2001) Rivers and Floods (With Special Reference to Floods in West Bengal), Breakthrough, Vol.9, No.2.